

Reply to Office Action of October 04, 2004
Amendment Dated: November 22, 2004

Appl. No.: 09/824,837
Attorney Docket No.: CSCO-004/3579

Listing of Claims

1 Claim 1 (Currently Amended): A method of providing different quality of services
2 (QOS) to different layer-3 datagrams to be transported from a first network device to a
3 second network device connected by a backbone, each of said first network device and
4 said second network device operating as a layer-3 device, said method comprising:

5 provisioning a tunnel in said first network device, said tunnel terminating at said
6 second network device via said backbone, said tunnel being implemented to provide
7 different QOS to different packets depending on a packet header for the corresponding
8 packet;

9 receiving a layer-3 datagram in said first network device, said layer-3 datagram
10 containing a datagram header and a datagram data;

11 examining said datagram header in said first network device to determine a QOS
12 to be provided to said layer-3 datagram;

13 forming at least one packet in said first network device by encapsulating at least
14 said datagram data with a layer-3 header, wherein ~~said at least said datagram data is~~
15 ~~encapsulated for transporting on~~ layer-3 header identifies said tunnel to said second
16 network device, said at least one packet containing a packet header to provide said QOS
17 determined by said examining; and

18 sending said at least one packet to said second network device on said tunnel,
19 whereby layer-3 datagrams receive different QOS based on the corresponding
20 datagram headers.

1 Claim 2 (Original): The method of claim 1, wherein said backbone is implemented
2 to transport packets according to asynchronous transfer mode (ATM) protocol.

1 Claim 3 (Original): The method of claim 2, wherein said provisioning further
2 comprises implementing said tunnel using a plurality of virtual circuits (VC) forming a
3 VC bundle, wherein each of said plurality of virtual circuits provides one of said different
4 QOS provided by said tunnel.

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1 Claim 4 (Original): The method of claim 2, wherein said at least one packet
2 comprises a plurality of packets, wherein each of said plurality of packets is formed
3 according to said ATM protocol.

1 Claim 5 (Original): The method of claim 1, wherein said tunnel is implemented
2 using UDP/IP packets, wherein each UDP/IP packet contains a TOS/Precedence field,
3 said TOS/Precedence field determining the QOS provided to the corresponding UDP/IP
4 packet, said at least one packet comprising a UDP/IP packet, said forming comprising
5 determining the value of said TOS/Precedence field according to said datagram header
6 of said layer-3 datagram.

1 Claim 6 (Currently Amended): The method of claim 5, wherein said layer-3
2 datagram comprises an IP datagram, and wherein said forming comprises copying the
3 TOS/precedence bits in said IP datagram to said TOS/precedence field of a UDP/IP
4 packet encapsulating said IP datagram, wherein the header of said UDP/IP packet
5 comprises said layer-3 header.

1 Claim 7 (Original): The method of claim 1, wherein said receiving comprises
2 receiving said layer-3 datagram on a point-to-point session, said method further
3 comprising indicating in said first network device whether to provide different QOS to
4 different datagrams received on said point-to-point session, wherein said first network
5 device provides different QOS to datagrams received on said point-to-point session based
6 on said indicating.

1 Claim 8 (Original): The method of claim 7, further comprising indicating in a table
2 a default QOS to be used with said point-to-point session, wherein said determining
3 comprises associating said default QOS to said layer-3 datagram if said datagram header
4 does not provide an indication of the QOS to be provided to said layer-3 datagram.

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1 Claim 9 (Original): The method of claim 1, wherein said first network device
2 comprises either a network access server (NAS) or a home gateway.

1 Claim 10 (Currently Amended): A first network device providing different quality
2 of services (QOS) to different layer-3 datagrams to be transported to a second network
3 device connected by a backbone, each of said first network device and said second
4 network device operating as a layer-3 device, said first network device comprising:

5 means for provisioning a tunnel terminating at said second network device via said
6 backbone, said tunnel being implemented to provide different QOS to different packets
7 depending on a packet header for the corresponding packet;

8 means for receiving a layer-3 datagram, said layer-3 datagram containing a
9 datagram header and a datagram data;

10 means for examining said datagram header to determine a QOS to be provided to
11 said layer-3 datagram;

12 means for forming at least one packet by encapsulating at least said datagram data
13 with a layer-3 header, wherein ~~said at least said datagram data is encapsulated for~~
14 transporting on layer-3 header identifies said tunnel to said second network device, said
15 at least one packet containing a packet header to provide said QOS determined by said
16 examining; and

17 means for sending said at least one packet to said second network device on said
18 tunnel,

19 whereby layer-3 datagrams receive different QOS based on the corresponding
20 datagram headers.

1 Claim 11 (Original): The first network device of claim 10, wherein said backbone
2 is implemented to transport packets according to asynchronous transfer mode (ATM)
3 protocol, wherein said means for provisioning implements said tunnel using a plurality
4 of virtual circuits (VC) forming a VC bundle, wherein each of said plurality of virtual
5 circuits provides one of said different QOS provided by said tunnel, wherein said at least

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6 one packet comprises a plurality of packets, wherein each of said plurality of packets is
7 formed according to said ATM protocol.

1 Claim 12 (Original): The first network device of claim 10, wherein said tunnel is
2 implemented using UDP/IP packets, wherein each UDP/IP packet contains a
3 TOS/Precedence field, said TOS/Precedence field determining the QOS provided to the
4 corresponding UDP/IP packet, said at least one packet comprising a UDP/IP packet, said
5 means for forming determining the value of said TOS/Precedence field according to said
6 datagram header of said layer-3 datagram.

1 Claim 13 (Currently Amended): The first network device of claim 12, wherein said
2 layer-3 datagram comprises an IP datagram, and wherein said means for forming copies
3 the TOS/precedence bits in said IP datagram to said TOS/precedence field of a UDP/IP
4 packet encapsulating said IP datagram, wherein the header of said UDP/IP packet
5 comprises said layer-3 header.

1 Claim 14 (Original): The first network device of claim 10, wherein said means for
2 receiving receives said layer-3 datagram on a point-to-point session, said first network
3 device further comprising means for indicating to indicate whether to provide different
4 QOS to different datagrams received on said point-to-point session, wherein said first
5 network device provides different QOS to datagrams received on said point-to-point
6 session based on said indicating.

1 Claim 15 (Original): The first network device of claim 14, further comprising
2 indicating in a table a default QOS to be used with said point-to-point session, wherein
3 said means for determining associates said default QOS to said layer-3 datagram if said
4 datagram header does not provide an indication of the QOS to be provided to said layer-3
5 datagram.

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1 Claim 16 (Original): The first network device of claim 10, wherein said first
2 network device comprises either a network access server (NAS) or a home gateway.

1 Claim 17 (Currently Amended): A first network device providing different quality
2 of services (QOS) to different layer-3 datagrams to be transported to a second network
3 device connected by a backbone, each of said first network device and said second
4 network device operating as a layer-3 device, said first network device comprising:

5 an input interface receiving a layer-3 datagram, said layer-3 datagram containing
6 a datagram header and a datagram data;

7 a marker determining a QOS to be provided to said layer-3 datagram;

8 a tunnel encapsulator encapsulating at least said datagram data with a layer-3
9 header to generate an encapsulated data, ~~said encapsulated data being encoded for~~
10 ~~transporting on layer-3 header identifies~~ a tunnel set up via a backbone to a said second
11 network device, said tunnel providing different QOS to packets having different packet
12 headers;

13 a forwarding block forming at least one packet to transport ~~said at least said~~
14 ~~datagram encapsulated data,~~ wherein ~~said at least said datagram encapsulated data~~ is
15 encapsulated for transporting on said tunnel, said at least one packet containing a packet
16 header to provide said QOS determined by said examining; and

17 an output interface sending said at least one packet to said second network device
18 on said tunnel,

19 whereby layer-3 datagrams receive different QOS based on the corresponding
20 datagram headers.

1 Claim 18 (Original): The first network device of claim 17, wherein said marker
2 examines said datagram header to determine said QOS.

1 Claim 19 (Original): The first network device of claim 18, wherein said layer-3
2 datagram is received on a point-to-point session.

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1 Claim 20 (Original): The first network device of claim 19, further comprising:
2 a memory indicating whether to provide different QOS to different layer-3
3 datagrams related to said point-to-point session; and
4 a classifier determining whether said layer-3 datagram relates to said point-to-point
5 session, wherein said marker provides different QOS to different layer-3 datagrams only
6 if said memory indicates that different QOS to different layer-3 datagrams relates to said
7 point-to-point session,
8 whereby said first network device provides different QOS to different layer-3
9 datagrams received only on some point-to-point sessions.

1 Claim 21 (Original): The first network device of claim 20, wherein said packet
2 comprises an ATM cell and said tunnel is implemented using a virtual circuit (VC)
3 bundle containing a plurality of virtual circuits, wherein each of said plurality of virtual
4 circuits is provisioned to provide one of said different QOS provided by said tunnel.

1 Claim 22 (Currently Amended): The first network device of claim 20, wherein said
2 packet comprises a UDP/IP packet containing a type of service (TOS)/precedence field,
3 wherein said layer-3 datagram comprises an Internet protocol (IP) datagram also
4 containing a TOS/precedence field, said marker providing at least some of the bits of said
5 TOS/precedence field of said IP datagram for copying into said TOS/precedence field of
6 said UDP/IP packet, wherein the header of said UDP/IP packet comprises said layer-3
7 header.

1 Claim 23 (Original): The first network device of claim 20, wherein said memory
2 further indicates a default QOS to be provided to datagrams received on said point-to-
3 point connection, wherein said marker accesses said memory to provide said default QOS
4 to said layer-3 datagram if QOS cannot be determined by examining said packet header.

1 Claim 24 (Currently Amended): A computer readable medium carrying one or
2 more sequences of instructions for causing a first network device to provide different

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3 quality of services (QOS) to different layer-3 datagrams when sending to a second
4 network device on a backbone, said first network device, each of said first network device
5 and said second network device operating as a layer-3 device, second network device and
6 said backbone being contained in a communication network, wherein execution of said
7 one or more sequences of instructions by one or more processors contained in said
8 network device causes said one or more processors to perform the actions of:

9 provisioning a tunnel in said first network device, said tunnel terminating at said
10 second network device via said backbone, said tunnel being implemented to provide
11 different QOS to different packets depending on a packet header for the corresponding
12 packet;

13 receiving a layer-3 datagram in said first network device, said layer-3 datagram
14 containing a datagram header and a datagram data;

15 examining said datagram header in said first network device to determine a QOS
16 to be provided to said layer-3 datagram;

17 forming at least one packet in said first network device by encapsulating at least
18 said datagram data with a layer-3 header, wherein ~~said at least said datagram data is~~
19 ~~encapsulated for transporting on~~ layer-3 header identifies said tunnel to said second
20 network device, said at least one packet containing a packet header to provide said QOS
21 determined by said examining; and

22 sending said at least one packet to said second network device on said tunnel,
23 whereby layer-3 datagrams receive different QOS based on the corresponding
24 datagram headers.

1 Claim 25 (Original): The computer readable medium of claim 24, wherein said
2 backbone is implemented to transport packets according to asynchronous transfer mode
3 (ATM) protocol.

1 Claim 26 (Original): The computer readable medium of claim 25, wherein said
2 provisioning further comprises implementing said tunnel using a plurality of virtual

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circuits (VC) forming a VC bundle, wherein each of said plurality of virtual circuits provides one of said different QOS provided by said tunnel.

Claim 27 (Original): The computer readable medium of claim 25, wherein said at least one packet comprises a plurality of packets, wherein each of said plurality of packets is formed according to said ATM protocol.

Claim 28 (Currently Amended): The computer readable medium of claim 24, wherein said tunnel is implemented using UDP/IP packets, wherein each UDP/IP packet contains a TOS/Precedence field, said TOS/Precedence field determining the QOS provided to the corresponding UDP/IP packet, said at least one packet comprising a UDP/IP packet, said forming comprising determining the value of said TOS/Precedence field according to said datagram header of said layer-3 datagram, wherein the header of said UDP/IP packet comprises said layer-3 header.

Claim 29 (Original): The computer readable medium of claim 28, wherein said layer-3 datagram comprises an IP datagram, and wherein said forming comprises copying the TOS/precedence bits in said IP datagram to said TOS/precedence field of a UDP/IP packet encapsulating said IP datagram.

Claim 30 (Original): The computer readable medium of claim 24, wherein said receiving comprises receiving said layer-3 datagram on a point-to-point session, said method further comprising indicating in said first network device whether to provide different QOS to different datagrams received on said point-to-point session, wherein said first network device provides different QOS to datagrams received on said point-to-point session based on said indicating.

Claim 31 (Original): The computer readable medium of claim 30, further comprising indicating in a table a default QOS to be used with said point-to-point session, wherein said determining comprises associating said default QOS to said layer-3

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4 datagram if said datagram header does not provide an indication of the QOS to be
5 provided to said layer-3 datagram.

1 Claim 32 (Original): The computer readable medium of claim 24, wherein said
2 first network device comprises either a network access server (NAS) or a home gateway.

1 Claim 33 (New) A communication system comprising:
2 an access network coupled to a plurality of remote systems, said access network
3 forwarding a layer-3 datagram based on data received from one of said plurality of remote
4 systems, wherein said layer-3 datagram contains a datagram header and a datagram data;
5 and

6 a communication network containing a backbone connecting a first network device
7 and a second network device, each of said first network device and said second network
8 device operating as a layer-3 device, said first network device being operable to:

9 provision a tunnel terminating at said second network device via said
10 backbone, said tunnel being implemented to provide different QOS to different
11 packets depending on a packet header for the corresponding packet;

12 receive said layer-3 datagram, said data header indicating that said layer-3
13 datagram is to be sent to said second network device;

14 examine said datagram header in said first network device to determine a
15 QOS to be provided to said layer-3 datagram;

16 form at least one packet in said first network device by encapsulating at
17 least said datagram data with a layer-3 header, wherein said layer-3 header
18 identifies said tunnel to said second network device, said at least one packet
19 containing a packet header to provide said QOS determined by said examine; and

20 send said at least one packet to said second network device on said tunnel,

21 whereby layer-3 datagrams receive different QOS based on the
22 corresponding datagram headers.

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1 Claim 34 (New): The communication network of claim 33, wherein said backbone
2 is implemented to transport packets according to asynchronous transfer mode (ATM)
3 protocol.

1 Claim 35 (New): The communication network of claim 34, wherein said provision
2 further comprises implementing said tunnel using a plurality of virtual circuits (VC)
3 forming a VC bundle, wherein each of said plurality of virtual circuits provides one of
4 said different QOS provided by said tunnel.

1 Claim 36 (New): The communication network of claim 34, wherein said at least
2 one packet comprises a plurality of packets, wherein each of said plurality of packets is
3 formed according to said ATM protocol.

1 Claim 37 (New): The communication network of claim 33, wherein said tunnel is
2 implemented using UDP/IP packets, wherein each UDP/IP packet contains a
3 TOS/Precedence field, said TOS/Precedence field determining the QOS provided to the
4 corresponding UDP/IP packet, said at least one packet comprising a UDP/IP packet, said
5 forming comprising determining the value of said TOS/Precedence field according to said
6 datagram header of said layer-3 datagram, wherein the header of said UDP/IP packet
7 comprises said layer-3 header.

1 Claim 38 (New): The communication network of claim 37, wherein said layer-3
2 datagram comprises an IP datagram, and wherein said forming comprises copying the
3 TOS/precedence bits in said IP datagram to said TOS/precedence field of a UDP/IP
4 packet encapsulating said IP datagram.

1 Claim 39 (New): The communication network of claim 33, wherein said receive
2 comprises receiving said layer-3 datagram on a point-to-point session, said first network
3 device being further operable to indicate whether to provide different QOS to different
4 datagrams received on said point-to-point session, wherein said first network device

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5 provides different QOS to different datagrams received on said point-to-point session
6 based on said indicating.

1 Claim 40 (New): The communication network of claim 39, wherein first network
2 device is further operable to indicate in a table a default QOS to be used with said point-
3 to-point session, wherein said determine comprises associating said default QOS to said
4 layer-3 datagram if said datagram header does not provide an indication of the QOS to
5 be provided to said layer-3 datagram.

1 Claim 41 (New): The communication network of claim 33, wherein said first
2 network device comprises either a network access server (NAS) or a home gateway.